THURSDAY, DECEMBER 24, 1903.

LUNGE'S SULPHURIC ACID.

A Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches. By George Lunge, Ph.D., Professor of Technical Chemistry in the Federal Polytechnic School, Zurich. Third edition, revised and enlarged. Pp. xxvii + 1214. (London: Gurney and Jackson, 1903.) Price 2*l.* 12*s.* 6*d.*

THE volumes before us, although bearing the above comprehensive title, in reality deal only with the manufacture of oil of vitriol, and together constitute vol. i. of the complete work. It is now upwards of a quarter of a century since this work was first published, and, thanks to the assiduity and painstaking zeal of its author, it still remains the standard treatise on the subject. Ten or a dozen years ago, at the time of the appearance, in fact, of the second edition of this work, it might have been supposed that all that need be known or stated with regard to a manufacture so highly specialised as that of oil of vitriol was already known, and was described in Dr. Lunge's classical work. But it is a striking instance of the essentially progressive character of chemical science that, even in a branch of its application so well established as this, in which, under the stress of competition, some of the acutest intellects which have ever devoted themselves to chemical technology have laboured for years with a view to make it perfect, there should have arisen during the last ten or twelve years what is practically a revolution in the manufacture—a new departure, in fact, which bids fair to alter the whole complexion of the industry.

It is this circumstance, no doubt, which has primarily led to the publication of this new edition. During the last few years there has been an enormous development of the manufacture of sulphuric anhydride, and oil of vitriol itself is being made in increasing amounts by contact-processes. It is commonly believed that the chamber process is doomed. Perhaps it is. But threatened industries, like threatened men, occasionally live long. Indeed, it is Dr. Lunge's opinion that the old lead-chamber will in all probability still yield the principal supply of ordinary sulphuric acid for many years to come. It is interesting to see how, indeed, the more modern processes have indirectly afforded a fresh lease of existence to the older one. The lead-chamber with all its appurtenances is too costly a plant to be lightly discarded, and so long as it can be kept going at a profit, so long will it continue to be used. The manufacture of oil of vitriol by the chamber process is one of those highly developed industries in which, by reason of its magnitude, small economies are all important, and, as Dr. Lunge's book shows, it is only by constant vigilance to prevent waste, and by promptitude to make use of improvements, that it can stave off what some people regard as its inevitable doom.

The compiler of a work of this character who seeks to achieve what Dr. Lunge defines to be his purpose—namely, to furnish chemical manufacturers with a trustworthy guide for actual practice as well as exhaustive scientific and technological information for all students of this branch of industry—must be prepared to suffer many rebuffs and disappointments in his search for truth. There is an obvious reference to this fact in the allusion to the studied reticence of the great acid trusts and "the somewhat narrow-minded apprehension" which fears "that by enlightening their neighbours they might injure their own interests." Luckily for the cause of technology there are manufacturers who, in the words of the author, "are far-seeing and large-hearted enough" not to restrict their experience "within the precincts" of their own business circle. To these men—and the list is a goodly one—Dr. Lunge is indebted for much valuable information.

The interested reader will naturally first turn to Dr. Lunge's account of the so-called contact-process, the process which, as already stated, in some form or other probably marks the direction which the manufacturer of the future is destined to take. In this respect the third edition, which, *pace* Dr. Lunge, we hope does not represent the last opportunity the author will have of treating the subject, constitutes a new departure, and is perhaps its most valuable, as it is its most interesting, feature. Thanks to the special communications of nearly all those who have been mainly instrumental in developing it, and more especially of the large firms concerned, Dr. Lunge has been enabled to elucidate, for the first time, the history of this special branch of a great industry. For much of our information concerning its present state, we are indebted to the Badische Anilin- und Soda-fabrik, who permitted Dr. Knietsch to make known many details of the process in the course of his remarkable and interesting lecture to the Berlin Chemical Society two years ago. The account then given has been supplemented by new and valuable information from the same firm, as well as from other manufacturers in Germany.

As has already more than once happened in the history of technology, and especially in chemical technology, the fundamental idea on which the modern method of making concentrated oil of vitriol depends had its origin in this country. It was Davy who, in 1817, first directed attention to the occurrence of what were at one time classed as "catalytic," but are now generally called "contact," reactions—phenomena which immediately engaged the attention of his relative, Edmund Davy, and thereafter of Döbereiner and Berzelius. But what is of special interest is that some years before Berzelius published his well-known paper on catalysis, the attempt was made in this country to turn contact action to account in the manufacture of oil of vitriol. In 1831 a vinegar manufacturer of Bristol named Peregrine Phillips took out a patent for "certain improvements in manufacturing sulphuric acid, commonly called oil of vitriol, viz., firstly, causing an instantaneous union of the sulphurous acid gas with the oxygen of the atmosphere, and so save saltpetre and the cost of vitriol chambers, by drawing them in proper proportions, by an air-pump or otherwise, through an ignited tube or tubes of platina, porcelain, or some material not acted on by heated sulphurous

© 1903 Nature Publishing Group

acid gas, in which are fine platina wire or platina in any finely divided state. The sulphuric acid formed is absorbed in a lead-lined tower, filled with pebbles over which water is made to trickle down."

With reference to this patent Dr. Lunge writes:—

"Undoubtedly we have here the fundamental features of the contact-process as now employed, and Peregrine Phillips must be called its inventor in the same way as Dyar and Hemming are the inventors of the ammonia-soda process. The history of both inventions presents some common features. Made and patented in England, within a very few years of each other, by persons otherwise absolutely unknown, evidently neither trained chemists nor practical manufacturers in their respective lines, they remained almost unnoticed in the country of their birth; they were taken up in foreign countries, at first by men of science, afterwards by manufacturers, but only after having suffered many checks were they brought to full technical success, both abroad and in England, after an almost equally long interval during which all attempts in that direction were judged hopeless."

There is no "tariff-wall" against the importation of English ideas into Germany. "Almost immediately after the publication of Phillips's patent two German scientists repeated his experiments." These were Magnus and Döbereiner, and on their observations Kuhlmann based his patent of 1838. Three years before this time Clement-Desormes was reported to have written, "I am convinced that in at most ten years it will be possible to make sulphuric acid on the large scale from its constituents without lead-chambers, nitric acid or nitrates." Events somewhat belied this confident prediction. What, however, was not possible during the first half of the last century was found to be perfectly practicable during the later years of the second half.

The space at our disposal precludes any attempt to show in detail how this result has been accomplished. All the main facts are set out in Dr. Lunge's account and in the interesting communications from the Badische Anilin- und Soda-fabrik, the Höchst Farbwerke, from the Schroeder-Grillo firm, the Mannheimer Verein, and last, but not least, in the account of the process as gradually developed under the direction of Clemens Winkler at Freiberg. Together the whole story constitutes one of the most interesting chapters in the history of the development of the manufacture of an article the production and consumption of which have been held to be a measure of the degree of a country's civilisation.

RELIGION, LIFE AND GENIUS.

Grundriss der Religionsphilosophie. By D. Dr. A. Dorner. Pp. xviii + 448. (Leipzig: Verlag der Dürr'schen Buchhandlung, 1903.) Price 7 marks.

Gesammelte Aufsätze zur Philosophie und Lebensanschauung. By Rudolf Eucken. Pp. 242. (Leipzig: Verlag der Dürr'schen Buchhandlung, 1903.) Price 4.20 marks.

Friedrich Nietzsche: sein Leben und sein Werk. By Raoul Richter. Pp. vi+288. (Leipzig: Verlag der Dürr'schen Buchhandlung, 1903.) Price 4 marks.

THE author of the "Grundriss der Religionsphilosophie" brings to his exposition a wide knowledge of the literature of the subject, and a very comprehensive grasp of the forms which religion has assumed in various countries and at different stages of its development. This preliminary mastery of the subject shows itself, not only in the mass of material actually used, but also in the tone of the book; it is marked by a gratifying breadth of treatment. After an introduction on the place of a philosophy of religion in a general scheme of philosophy, there follows a lengthy sketch of the phenomenology of the religious consciousness. From this the author proceeds to the metaphysic of religion, dealing with the existence, essence and actuality of God. This forms the second division of this part; the third is devoted to the psychology of the religious subject, to belief and certainty. The second part is concerned with outward expressions of belief, and deals historically and critically with various developments, from sacrifice to prayer and contemplation, on what may be called the subjective side, and, on the objective side, with local cults, feasts, and symbols. The section concludes with discussions on the relation of religion to morality, knowledge and art. Finally, the laws of the religious life are briefly discussed.

This programme will indicate the comprehensiveness of the author's treatment. The book attains unity in its multiplicity by virtue of the leading idea round which the facts are grouped. Religion, in its widest sense, is taken to be the spiritual life of the individual. As such we expect to find it subject to development; progress is as possible here as elsewhere, and, in fact, the history of the forms of religion shows a gradual purification and emancipation advancing with the gradual refinement of experience. The goal is a union of God and humanity; the end must not be in abstractions, but in the concrete realisation of unity in life and purpose, for which, as for the unity of the world as object of the sciences, the reality of the Divine immanence is the only true ground.

To a great extent this is a position which most thinkers could accept, with the exception of one point. The distinction between the theological and non-theological philosopher rests finally on the view each takes of his ultimate. The author seems well aware that this is the crux; he expressly avoids pantheism, and would assert the rights of the individual. But what, then, is the relation between God and the individual? The answer seems inadequate in so far as certain theological aspects of God are assumed, while no proof is given that contradictions must be unified or that a unity for us can only be grounded in a unity that is for itself. Here the religion and the philosophy make a compromise not altogether unfamiliar. We regret that we cannot follow the author here; others may succeed better, and certainly no one will fail to see that his book is a valuable contribution toward a philosophical treatment of religion.

The essays and addresses of Rudolf Eucken were well worth publishing in book form. They fall into three classes. The first group deals with political philosophy. The author is mainly interested in the opposition of mechanism and spirit which is characteristic of the present age. Man, striving to subdue nature, builds up a vast mechanism; in the human

© 1903 Nature Publishing Group